

Linux® on IBM LinuxONE™ and IBM Z® Capacity and Solution Planning

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GlassHouse Systems Inc.

■ Background

- Established in 1993 as an enterprise IT infrastructure provider
- HQ in Toronto, operating throughout Canada and the USA
- Enterprise clients, public and private sector, cross industry
- Preeminent IBM Business Partner in Canada



■ Value to clients

- Our commitment – to every customer success with long term relationships
- Our team – senior technical and sales professionals with deep technical skills, and an understanding of IT industry directions and business drivers
- Our technology partners – leading IT providers, committed and working with GHS to execute and deliver solutions that address specific challenges
- Our experience and execution – assessment, design, implementation, on-going support and ease of use

GlassHouse Systems Inc. offerings

Systems	Software	Services
▪ IBM Z, IBM Power, IBM Storage ▪ Lenovo Enterprise Systems ▪ VMware Hybrid Cloud ▪ CISCO® Networking, UCS™, VersaStack™	▪ Security – SIEM, Patch Management, Data Security ▪ Analytics – Descriptive, Predictive, Cognitive ▪ Recovery – Software Defined Storage Solutions, Enterprise BC	▪ GHS insight™ – Capacity & Performance Analysis; Solution Design; Configuration Development & Validation ▪ GHS advantage™ – On-site Professional Services; SoW Driven and PM managed; Assessments, Migrations & Implementation ▪ GHS manage™ – IBM AIX Cloud; IBM i Cloud; Linux Cloud; RIMS; Security Managed Services

Topics

- **LinuxONE Emperor II overview**
- **Where to use Linux on IBM Z**
- **Selecting the “right” applications**
- **Selecting a hypervisor**
- **Sizing for server consolidation from “distributed” servers**
- **Sizing for new workloads**



Note: Linux on IBM Z is the name for IBM uses for Linux running on IBM Z servers. IBM Z is the family name for all IBM mainframes. LinuxONE is the family name for all Linux-only IBM servers using IBM Z architecture.

Introducing the IBM LinuxONE Emperor II

Designed for the unpredictable nature of next generation data with our unique scaling, security and reliability on a proven platform designed from the ground up for data transactions.

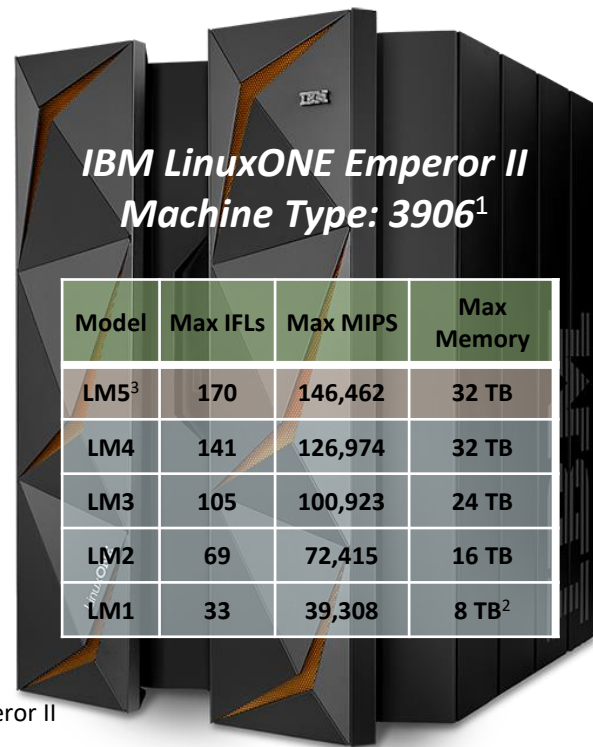
- **Unmatched Performance and Vertical Scale**
 - Vertical scale to 170 cores, equivalent to over 1000 x86 cores
 - Industry-leading performance of Java workloads (up to 50% faster than x86 alternatives)
 - Simplification to make the most of your Linux skill base and improve time to value
 - Enhanced SIMD to accelerate analytics workloads and decimal compute
 - Pause-less garbage collection to enable vertical scaling while maintaining predictable response times
- **Efficient and Powerful Security**
 - Ultimate workload isolation and pervasive encryption through Secure Service Containers and SCaaS (SoD)
 - Encryption of data at rest without application change and with better performance than x86
 - Protection of data in flight over the network with full end-to-end network security
 - Use of Protected Keys to secure data without giving up performance
 - Industry-leading secure Java performance via TLS (2-3x faster than x86 Alternatives)
- **Foundation for data serving and next generation apps**
 - Add performance and security to new Open source DBaaS deployments
 - Develop new blockchain applications based on a proven High Security Business Network (HSBN)
 - Consolidate per core priced Databases for software savings
 - Support for data-in-memory applications and new workloads using 32 TB of memory
 - Blazing fast I/O subsystem supporting over 48M (4k block) IOPS

Emperor II: Engineered for performance and scale

■ Models, cores, and processing power

- 5 models across 4 drawers supporting up to 170 cores
- 5.2 GHz 14nm SOI technology
- 15% better SMT performance over LinuxONE Emperor
 - ~ 25% over single threaded
- 35% more capacity over LinuxONE Emperor
- 1.5x more on-chip cache per core optimized for data serving
- Up to 23 SAPs per system, standard plus SAPs are SMT
- 2 spares designated per system
- Enhanced performance of crypto coprocessor
- Enhanced SIMD performance to boost traditional workloads using decimal arithmetic and new applications like analytics
- Pause-less garbage collection enables enterprise scale Java applications to run with fewer and shorter pauses for garbage collection on larger and larger heaps
- Support for up to 85 partitions with EAL5+ for leading workload isolation

1. There are no upgrades to Emperor II
2. Minimum memory is 256 GB
3. LM5 is factory-build only, no upgrades to LM5



*IBM LinuxONE Emperor II
Machine Type: 3906¹*

Model	Max IFLs	Max MIPS	Max Memory
LM5 ³	170	146,462	32 TB
LM4	141	126,974	32 TB
LM3	105	100,923	24 TB
LM2	69	72,415	16 TB
LM1	33	39,308	8 TB ²

Emperor II: Engineered for performance and scale

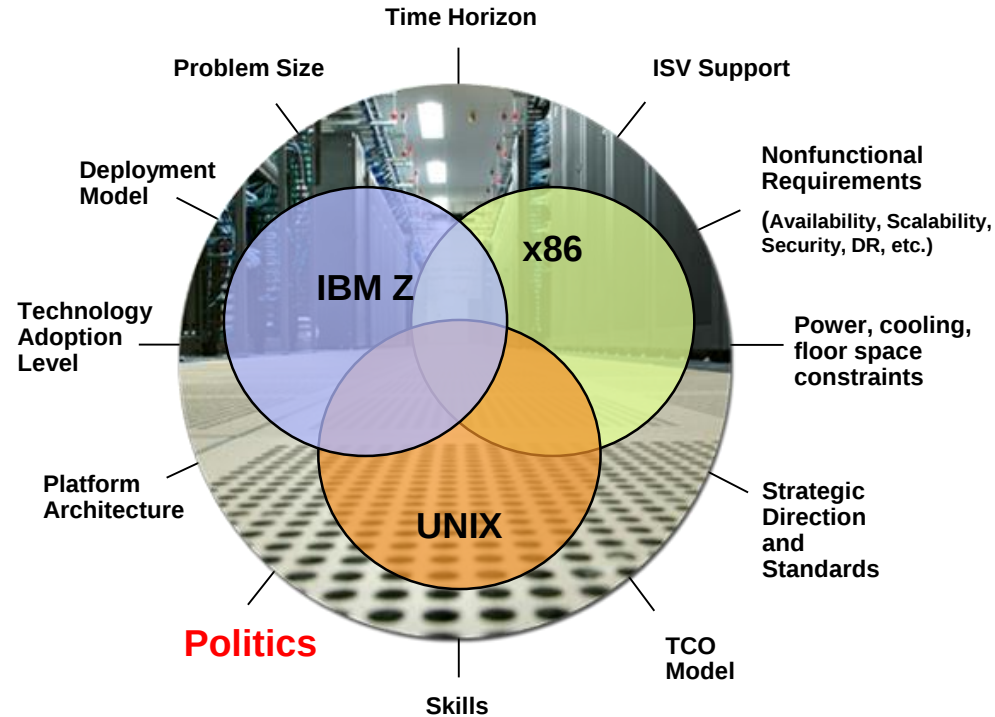
- **Out performs x86:**
 - pgBench benchmark on [PostgreSQL 9.6.1](#) with up to **2x** more throughput per core
 - YCSB benchmark on [MongoDB 3.4.1](#) with up to **2.6x** more throughput per core
 - DayTrader benchmark on [WebSphere Application Server 8.5.5.9](#) with up to **1.9x** more throughput per core
 - DayTrader [Apache TomEE 1.7.1](#) with up to **2.3x** more throughput per core
 - Acme Air benchmark on [node.js 6.10](#) with up to **2.5x** more throughput per core
 - Run the MicroBM CPU benchmark on [InfoSphere DataStage 11.5](#) with up to **2.8x**
- **Scales without compromise:**
 - **1344 concurrent databases** executing a total of **377 billion database transactions per day** on a single LinuxONE Emperor II server.
 - **25% more MongoDB** guests with the same throughput **under z/VM 6.4** on LinuxONE Emperor II compared to LinuxONE Emperor.
 - Scale out to 170 cores running MongoDB databases **under z/VM 6.4**, each with a constant throughput and not more than **10us latency increase per additional MongoDB instance**.
 - Scale-out to **2 million Docker containers** in a single LinuxONE Emperor II system, no application server farms necessary.
 - Scale-up a single MongoDB instance to **17 TB** in a single system without database sharding and get **2.4x** more throughput and 2.3x lower latency on LinuxONE Emperor II **leveraging the additional memory** available compared to LinuxONE Emperor.
 - Run MongoDB under **z/VM 6.4** on LinuxONE Emperor II and get **4.8x better performance leveraging additional memory** available per z/VM instance compared to LinuxONE Emperor.
 - Run the **AcmeAir** benchmark with up to **xx% more throughput using diagonal scale** on LinuxONE Emperor II compared to using only scale-out on a compared x86 platform.

Where to use Linux on IBM Z

- **Most customers first consider Linux on IBM Z for server consolidation**
- **From there customers start using Linux on IBM Z to front-end their legacy z/OS, z/VSE, and z/TPF systems**
- **Finally, Linux on IBM Z becomes a platform for new workloads**
- **Of course, the order may be different for you**
- **My customer experience shows that usage today is split more-or-less evenly between these three environments**

Fit for purpose, workload and situation

- Many factors influence platform selection, making it difficult to present a simple selection matrix
- Some factors are specific to each business, others are common to all and can be generalized



What makes the best fit?

- **Leverage classic strengths of IBM Z**
 - High availability
 - High I/O bandwidth capabilities
 - Flexibility to run disparate workloads concurrently
 - Requirement for excellent disaster recovery capabilities
 - Security
- **Shortening end to end path length for applications**
 - Collocation of applications
 - Consolidation of applications from distributed servers
 - Reduction in network traffic
 - Simplification of support model

- **Consolidation effect**
 - Power requirements
 - Software costs
 - People Costs
 - Real Estate
 - Workloads requiring extreme flexibility



Best fit for Linux on IBM Z

Solutions for Linux on IBM Z

- **Cloud:** Leveraging open-standards and the API economy, securely connecting services across systems, mobile devices and other cloud platforms
- **Cognitive:** Database, data integration, analytics and cognitive solutions
- **Application development and DevOps:** Virtualized, integrated solutions for application development
- **Mobile:** Use of mobile protocol connectivity to sync existing apps and queries to mobile and cloud environments
- **Open source software:** Innovation and quality of service for next generation applications
- **Security and availability:** Features and applications are available to support a complete and cost-effective security infrastructure
- **Vendor software:** Broad range of Linux software and solutions available

Selecting the “right” applications

- **Not all middleware (Open Source or commercial) is available for Linux on IBM Z**
 - Major IBM and ISV server middleware is available
 - Most Open Source *server* packages are available
 - You need to research availability of all the software you will be using before you proceed further
 - If particular piece of software is not available, contact IBM or your BP to ask for help (they may or may not be able to provide a solution)
 - Don't assume when a vendor tells you that Linux on IBM Z is supported, they often don't know what they are talking about (speak to a techie, not a rep)
 - If all the pieces an application requires are not available, find a different application

Selecting a hypervisor

- **Hardware Partitioning Solutions**

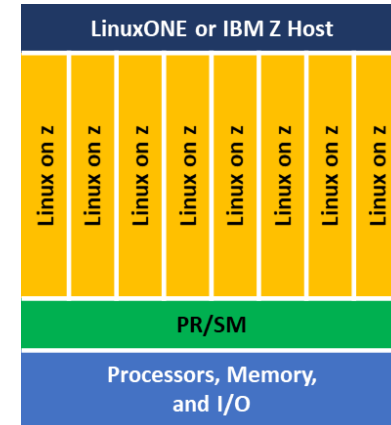
- IBM Processor Resource/System Manager™ (PR/SM™)
- IBM Dynamic Partition Manager (DPM)

- **Virtualization Solutions**

- IBM z/VM® + IBM Wave
- KVM for IBM Z from SUSE Labs (SLES) or Canonical (Ubuntu)

Selecting a hypervisor – PR/SM

- The “standard mode” of PR/SM allows you to divide one physical server into logical partitions (LPARs)
 - 3906 (z14 and LinuxONE Emperor II) and 2964 (z13[®] and LinuxONE Emperor) up to 85 LPARs
 - 2965 (z13s[™] and LinuxONE Rockhopper) up to 40 LPARs
 - 2827 (zEnterprise[®] EC12 aka zEC12) up to 60 LPARs
 - 2828 (zBC12 and LinuxONE Rockhopper) up to 30 LPARs
- Share resources across LPARs or dedicated to a particular LPAR
- Managed through the Hardware Management Console (HMC)
- Running a mix of multiple z/OS[®], z/VM, Linux on IBM Z, z/TPF, KVM for IBM Z, and z/VSE[®] instances isolated and secured in parallel



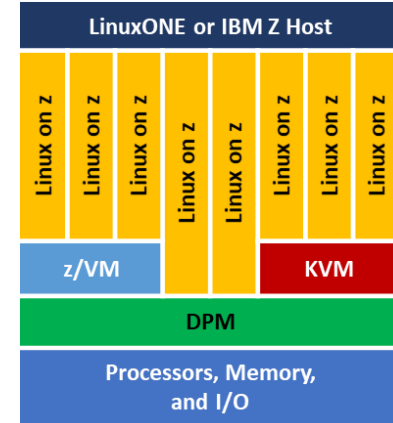
Selecting a hypervisor – IBM Dynamic Partition Manager

■ Simplified configuration of logical partitions

- Standardizes configuration and management of all system resources from a single management endpoint
- Developed for servers with z/VM 6.4, KVM, and/or Linux as a partition-hosted operating system
- Ease Linux installation with auto configuration of devices¹
- Guided storage setup, provisioning and management
- SOD: FICON ECKD support
- Secure FTP through HMC for booting and installing an operating system via FTP

■ Benefits for users new to IBM Z²:

- Modify system resources without disrupting running workloads
- Create alarms for events, conditions, and state changes
- Update individual partition resources to adjust capacity, redundancy, availability, or isolation

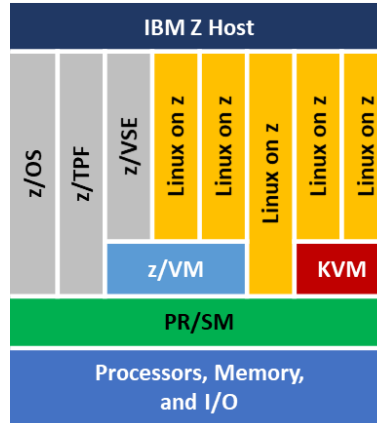


1. Where Linux distro installers exploit function
2. Not available for z/OS, z/VSE, or z/TPF

Selecting a hypervisor – KVM or z/VM

■ z/VM

- World class quality, security, reliability – powerful and versatile
- Extreme scalability creates cost savings opportunities
- Exploitation of advanced technologies, such as shared memory (Linux kernel, executables, communications)
- Highly granular control over various resources
- Improves productivity by hosting non-Linux workloads such as z/OS, z/VSE, and z/TPF



■ KVM for IBM Z

- Standardizes configuration and operation of server virtualization
- Leverage common Linux administration skills to administer virtualization
- Flexibility and agility leveraging the Open Source community
- Provides an Open Source virtualization choice
- Provided by distributors

Selecting a hypervisor – KVM for IBM Z

- **Optimized for IBM Z and IBM LinuxONE and multiple types of workloads**
- **Business applications remain active while workloads are relocated for load balancing or scheduled hypervisor downtime**
- **Higher-level virtualization functions so critical workloads receive resources and priority based on established goals**
- **Coexists with z/VM, Linux on IBM Z, z/OS, z/VSE, and z/TPF**

Note: KVM for IBM Z is available in SUSE SLES and Canonical Ubuntu distributions for IBM Z. Red Hat does not provide support for KVM on IBM Z.

Selecting a hypervisor – KVM for IBM Z

- **Standard interfaces enables single cross-platform virtualization to help simplify systems management**
- **Optimize consolidation of Linux workloads to help reduce operational costs**
- **Maintain flexibility and agility by exploiting the Open Source Community**
- **Leverage traditional Linux administrative skills to administer virtualization simplifying operational control of the environment**
- **Use open source tools like OpenStack to simplify management of virtualization**
- **Easy integration of Linux servers into existing infrastructure leads to faster time to market**

Selecting a hypervisor – z/VM

- **z/VM's world class industry proven virtualization technology offers the ability to host extremely large number of virtual servers on a single server**
- **Host non-Linux environments with z/VM on IBM Z – z/OS, z/VSE and z/TPF**
- **Virtual machines share system resources with very high levels of resource utilization**
- **Optimized for IBM Z architecture multi-tenancy, capacity on demand and support for multiple types of workloads**

Selecting a hypervisor – z/VM

- **World class quality, security, reliability**
- **Extreme scalability creates huge cost savings opportunities**
 - Software licensing
 - Hardware maintenance and networking
 - Floor space and energy
- **Exploitation of advanced technologies, such as:**
 - Shared memory (Linux kernel, executables, communications)
 - Virtual networking (switches, LANs)
- **Highly granular control over resource pool**
- **Valuable tool for disaster recovery and resiliency plans and processes**

Should you consolidate servers?

- **Once you know that your applications will run on Linux on IBM Z and you have decided on how to run them, the next step is to determine:**
 - How large a IBM Z server is required?
 - Is it cost effective to consolidate the servers?
 - Performance on IBM Z CPUs is comparable to CPUs on other platforms of similar speed
 - CPU speed is not the entire story – it's in the architecture!
 - Architecture designed for multiple or consolidated workloads
 - IBM Z has definite advantage with applications that have mixed CPU and I/O
 - Good planning is essential
 - IBM can perform sizing estimates and assist with planning and initial installation needs

Tools to assist in consolidation analysis

- **IBM has several no-charge offerings available for this effort**
 - SURF, SCON, RACEv, and IT Economics (Eagle) studies are provided by IBMers
 - LinuxONE Cost Savings Estimator analysis is provided by IBMers or business partners
 - The IBM LinuxONE TCO calculator is available on the web to anyone

SURF and SCON

- **SURF is a tool which takes basic performance data from distributed servers along with server definitions from SCON to derive a concurrent peak utilization**
- **SCON is a tool which uses the utilization information from SURF (or manually derived) along with server definitions from IDEAS International to provide an IBM Z server sizing (IFLs or MIPS)**
- **These tools are Lotus 1-2-3 spreadsheets (really) and the analysis is done by IBMers (usually in the WSC)**
- **Even if you don't use the tools, the collection exercise is a very useful exercise**

SCON worksheet – Workloads

No.	Workload Type	Typifying Middleware	Workload Category Description
1	Middleware-Based Default	N/A	Null
2	CPU Intensive		CPU Intensive: High CPU utilization, lots of calculations, small memory usage, very high cache hits rates.
3	Java Heavy	WAS, Portal Server, Weblogic	SCON: WAS: Substantial Java Application. Java applications that are compute intensive (e.g. large XML object processing)
4	Java Medium	WESB, Process Server	Middle of the road java applications. Use this value if you do not know details about a Java application
5	Java Lite	WAS, BEA Weblogic	SCON: WAS: Little Java Content. Java applications that are heavy I/O users
6	Database	DB2, Oracle	SCON: DB Production. Database and "database-like" work in service to batch or transactional read/write applications.
7	Mixed High		Multiple applications on distributed systems, or applications with multiple contexts
8	Mixed Low	VMware, Webfocus	Multiple applications on distributed systems, or applications with multiple contexts with higher degree of virtualization or context switching than Mixed High
9	Data Intense, I/O Bound		Extremely large memory working set sizes, very active context switching, low cache hit rates (lots of virtualization).
10	TSM	Tivoli Storage Manager	SCON: Misc: Tivoli Storage Manager

Note: There are 35 workloads, this is a partial list

SCON Worksheet – Accuracy is essential

- **Fill out the SCON worksheet completely, the more accurate the data the more accurate the result**
- **The information required is:**
 - Machine Name (this is used in SURF as the file name of the data file)
 - Vendor (IBM, CISCO, Dell, Fujitsu/Siemens, HP, Oracle/Sun)
 - Model/Type , # Chips, # Cores, CPU Ghz (this is used in SCON along with the vendor to find the right entry in the IDEAS International database)
 - Mode (native or virtual)
 - Entitled Cap (if running virtualized, the cap in number of cores, i.e. on a 4 core system if a virtual image gets 1.5 cores use "1.5")
 - Average Utilization, Peak Utilization (SURF will derive accurate info)
 - Quantity of Identical Machines
 - Type of Workload (numeric code)
 - Comments (anything that may be useful to the person doing the analysis)
- **For a copy of the SCON Sizing Input Sheet, e-mail me**

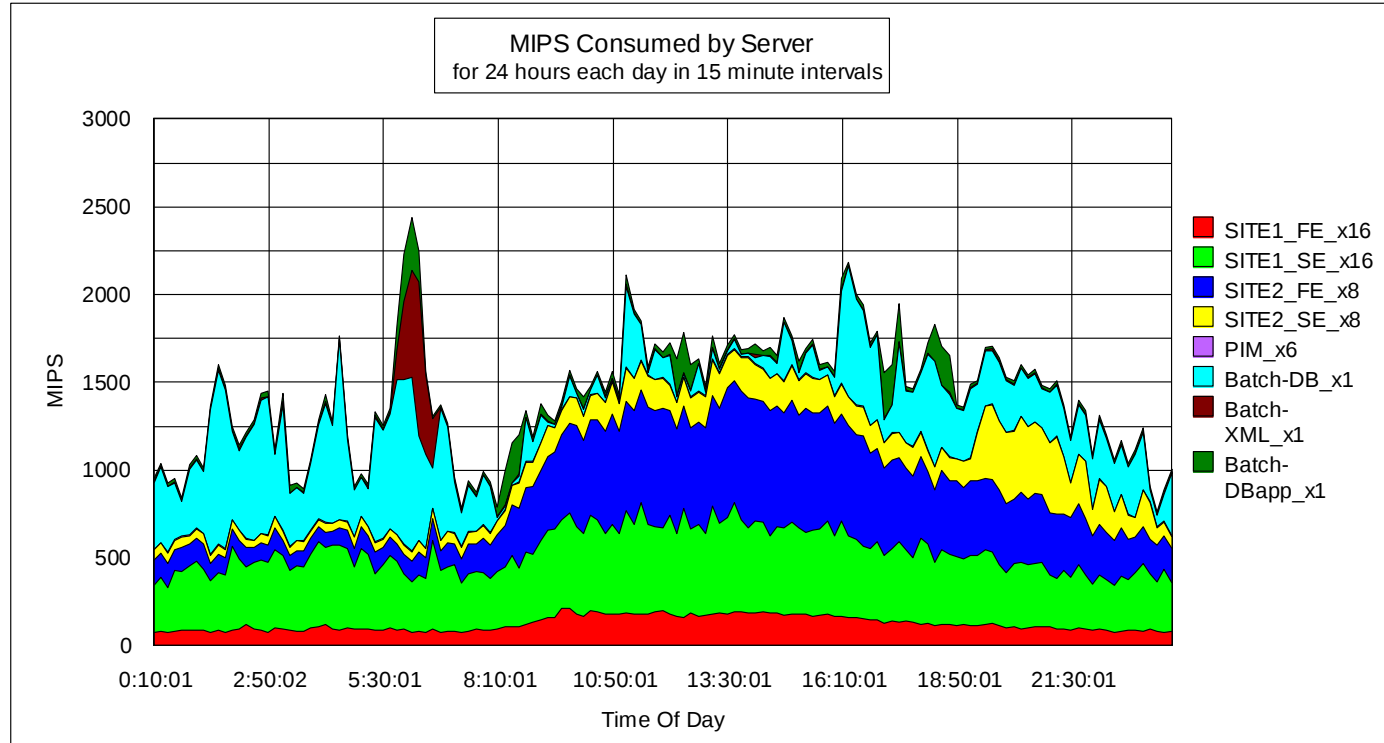
SURF Data Collection

- Please select at least a day's worth of data but not more than 15 days
- These days should be representative of the workload that you would like to have analyzed
- Please ensure that the data sent includes peak workload intervals, the intervals should be 15 minute intervals and that the time stamps for all servers match up (required to give an accurate concurrent peak)
- There should be one file for each server, name the file with the servername and a suffix of csv (e.g. atlanta2.csv)
- The data in the file should contain one line per time interval (tab delimited)
- The following are required fields:
 - Date MM/DD/YY Required
 - Time HH:MM:SS Required
 - USR Number Required
 - SYS Number Required
- The following are optional fields, but it is suggested that they be included:
 - WAIT Number Optional
 - IDLE Number Optional
- Example of a log file:

– Date	Time	Usr	Sys	Wait I/O	Idle
– 11/8/2007	13:05:00	7	4	0	89
– 11/8/2007	13:10:00	10	5	0	85
– 11/8/2007	13:15:00	11	4	0	86
– 11/8/2007	13:20:01	13	5	0	82
- The order of the fields is not critical, but do NOT combine the day and time into one field.
- These fields are the standard output of a UNIX or LINUX or WINDOWS performance monitor like VMSTAT, SYSTAT, or Perfmon.
- For a copy of the SURF Data Collection Guide, e-mail me

SURF – Output is detailed utilization info

- SURF produces several tables and graphics using the performance data files and the SCON spreadsheet's server information
- SURF will determine when and what the concurrent peak was (in this case 2,441 MIPS equivalent)
- SURF will use this information to populate the SCON spreadsheet



SCON – Output is estimated IFLs

- SCON used the IDEAS International RPE data along with the workload information supplied by the customer to determine equivalent IBM Z MIPS
- Using either customer provided capacity information or utilization information from SURF, SCON translates this into required IFLs for the selected processor family

zP5G - Server Consolidation: Projected Utilization

v2011H10 - 07/12/2011

Processor Selection Guide for IBM System z

SCON (Server Consolidation Tool)

Linux / Unix Server Consolidation

XYZ Corp: Consolidating 8 boxes, 8.00 servers (8 applications)

Utilization for 8 Servers (without considering z/VM)

Capacity values derived from z/OS-1.11 LSPR data (07/22/2010)

Capacity basis: 2094-701 @ 593 MIPS for a single partition configuration

Capacity ratings are based on the LSPR workload category "Low"

				Utilization for Case 1				Utilization for Case 2			
				< Complementary Peaks Concurrent >				< Complementary Peaks Concurrent >			
Processor	Feature	MSU	Capacity Rating	0%	40.0%	70.0%	100%	0%	40.0%	70.0%	100%
IBM z196 IFL											
2817-7xx I1	1W IFL		1,280	122%	150%	170%	191%	60%	81%	97%	112%
2817-7xx I2	2W IFL		2,508	62%	77%	87%	98%	31%	42%	50%	57%
2817-7xx I3	3W IFL		3,716	42%	52%	59%	66%	21%	28%	34%	39%
2817-7xx I4	4W IFL		4,903	32%	39%	45%	50%	16%	22%	26%	30%
2817-7xx I5	5W IFL		6,070	26%	32%	36%	41%	13%	17%	21%	24%
2817-7xx I6	6W IFL		7,217	22%	27%	31%	34%	11%	15%	18%	20%
2817-7xx I7	7W IFL		8,344	19%	23%	27%	30%	10%	13%	15%	18%
2817-7xx I8	8W IFL		9,453	17%	21%	24%	26%	9%	11%	14%	16%
2817-7xx I9	9W IFL		10,542	15%	19%	21%	24%	8%	10%	12%	14%
2817-7xx I10	10W IFL		11,613	14%	17%	19%	22%	7%	9%	11%	13%
2817-7xx I11	11W IFL		12,666	13%	16%	18%	20%	7%	9%	10%	12%
2817-7xx I12	12W IFL		13,701	12%	14%	16%	18%	6%	8%	9%	11%

RACEv – TCO analysis

- **Right-fitting Applications into Consolidated Environments (RACEv) is an approach that is used by IBMers (usually IBM Z Client Architects) to size and subsequently project the financial benefits of consolidating to a virtualized server environment**
- **It demonstrates which platform option offers the most attractive financial attributes for your next project**
- **RACEv requires a lot of input data from the customer as it provides a true Total Cost of Ownership study covering 5 years and all costs related to a project**
 - Using SURF/SCON first will provide accurate data for the RACEv analysis (not required, but I recommend it)
- **Consolidation targets can be Linux on IBM Z, AIX, or Linux on Power, and other platforms so you get a true 5-year comparative analysis**

IBM LinuxONE TCO calculator

- **If you want a quick view of what the TCO would be, try the TCO calculator and see:**
 - Your estimated TCO over three, four or five years
 - Your likely payback in months, ROI and IRR
 - Your likely consolidation savings
- **How it works**
 - By answering just a few questions such as hardware, workload type and software, the LinuxONE TCO calculator provides a high-level total cost of ownership based on your answers and industry-proven assumptions.
 - While this is not intended to provide an exact cost, in just a few minutes you can see how LinuxONE can help you. If you like what you see, contact us for a complimentary on-site assessment.
- **The calculator is available at**
<https://extbasicdsgtool.podc.sl.edst.ibm.com/dsg/linuxone/>

IBM LinuxONE TCO calculator

- **Helps to calculate the financial advantage of LinuxONE with:**
 - 3 to 5 year TCO comparison between your x86 environment and a LinuxONE solution
 - Payback in number of months, ROI and IRR
 - Cost reduction as a result of consolidation onto LinuxONE
 - Calculates TCO factors such as hardware, workload type, IBM and ISV software, facility costs (space, energy), maintenance charges, server utilization, hypervisors, migration
- **The SCON worksheet can be used to collect the required data**

IBM LinuxONE TCO calculator – Sample output

LinuxONE Consolidation TCO Assessment (Prod)

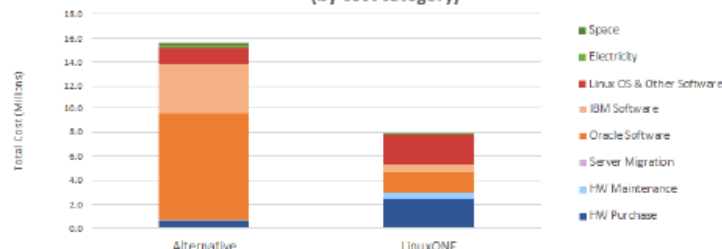
Customer: **Friendly Bank**

Investment Payback in **0.0 months**, TCO reduced by **48.9%** in 5 years (IRR= 201.5%, ROI= 95.5%) **7.6 Million in Savings over 5 Years!**

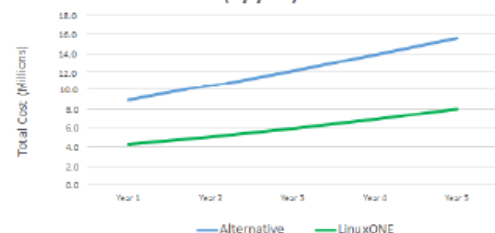
	HW Purchase	HW Maintenance	Server Migration	Oracle Software	IBM Software	Linux OS & Other Software	Electricity	Space	# of Servers	# of Cores
Alternative	554,946	93,242	0	9,892,000	4,252,500	1,435,000	160,483	200,000	20	400
LinuxONE	2,461,174	545,973	0	1,687,770	577,125	2,520,000	70,086	100,000	2	39
	471.2%			19.0%	13.6%	175.6%	43.7%	50.0%	10%	10%

	Year 1	Year 2	Year 3	Year 4	Year 5	5-Year Total Savings
Alternative	8,895,143	10,535,319	12,195,536	13,935,733	15,569,171	
LinuxONE	4,345,129	5,112,684	5,880,639	6,921,380	7,952,122	7,607,049

Accumulated Cost Comparison
(by cost category)



Accumulated Cost Comparison
(by year)



Alternative Sizing

	# of servers	Year 1	Year 2	Year 3	Year 4	Year 5
Distributed Servers (cores)	20	400	400	400	400	400
DR Servers (cores)	0	0	0	0	0	0
Power (kW)		16	16	16	16	16
Space (sq)		80	80	80	80	80

Alternative Pricing

	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
HW Purchase	554,946					554,946
HW Maintenance	0	0	0	0	0	0
Linux OS SaaS	35,000	35,000	35,000	35,000	35,000	175,000
Oracle Software	9,892,000	930,600	930,600	930,600	930,600	9,883,000
IBM Software	2,362,500	472,500	472,500	472,500	472,500	4,250,000
Other Software	700,000	140,000	140,000	140,000	140,000	1,260,000
Electricity	32,087	32,087	32,087	32,087	32,087	160,483
Space	40,000	40,000	40,000	40,000	40,000	200,000
Total	8,895,143	1,650,197	1,650,197	1,650,197	1,733,439	15,569,171

IT Economics – IBM Eagle studies

- **Determining the right platform for your workloads**
 - Understanding the IT economics of your business is essential to minimize cost and enable growth
 - Analyzing your true costs and identifying areas for savings is time consuming and complex
- **How does an IT Economics study help you?**
 - An IT Economics study facilitates the decision making process
 - The analysis in the report provides you with a detailed assessment of your existing solution and possible alternatives, and offers recommendations to reduce IT spending
 - It is a business case, enabling you to make a financially based IT decisions
- **How long does a study take?**
 - A study can be completed in three to four weeks
- **Contact IBM for an IT Economics study**
 - Ask your IBM representative, business partner or request an exploratory call with an IBM Eagle team member
 - <http://www.ibm.com/iteconomics>

Sizing for new workloads

- **New workloads can be front-ending a legacy system (z/OS, z/VSE, z/TPF)**
 - Examples include Cognos, InfoSphere, WebSphere, SAP
- **New workloads can also be applications that might otherwise be run on an x86 or RISC server**
 - Examples include Oracle DB, Db2 LUW, WebSphere, or Open Source projects
- **The same tools are used as for server consolidation, but customers have to estimate the “distributed” server capacity**
 - Most major software products have tools which provide an estimate of the x86 servers required for a given workload and this info can be used as input to the Linux on IBM Z sizing tools

Summary

- **There are several tools available which can help you to size a Linux on IBM Z workload**
- **Accuracy of the data you use as input to the tools is essential to getting a valid sizing**
- **First make sure your workload will run on Linux on IBM Z**
- **Second ensure the required capacity makes financial sense**
- **Good luck – IBM and your business partner are here to help you in building a successful solution**

Contact GlassHouse Systems

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